1.4 Emergence theory; a methodology for landscape study

In his 1995 dissertation *Landscape Emergence*, landscape architect Blake Belanger writes:

> "Conventional landscape theory for the last two centuries has considered landscape as a peripheral scenic object, a spatial cultural construct or an ecological asset. These dualistic paradigms address landscape as image, space, and commodity, but fail to discuss its fundamental complexity."
>
> (Belanger, 1995: 2)

Emergence theory, Belanger argues, provides us with the basis for and description of this complexity. Inevitably, different writers define emergence in slightly different ways. Steven Johnson, in his popular science book *Emergence*, describes a number of different emergent systems in animals, humans and computing. He uses the example of studies of morphogenesis in slime mould (Dictyostelium discoideum), beginning with the work of microbiologist Evelyn Keller from 1968 onwards. He calls morphogenesis "the capacity of all life-forms to develop ever-more baroque bodies out of impossibly simple beginnings." (Johnson, 2002: 14). He describes the apparent simplicity of slime moulds, which, during the winter, are independent single-celled amoeba-like organisms. However, under the conditions of a temperate summer the individuals "coalesce in to a single, larger organism which begins its leisurely crawl across the garden floor, consuming rotting wood and leaves as it moves about"(Johnson, 2002: 13). For thirty years this phenomenon was not understood, and scientists believed the behaviour could only be instigated and controlled by 'pacemaker' cells, which took the role of 'managing' the organism, but such cells could not be found. Only in recent years has there been an agreement that "slime mould aggregation is now recognized as a classic study in bottom-up behaviour."(Johnson, 2002: 16). In other words, it is self-organizing, a complex adaptive system of continual interactions, which illustrates the nature of emergence: "the movement from low-level rules to higher-level sophistication is what we call emergence." (Johnson, 2002: 18).

Many thinkers from diverse fields contribute to our understanding of emergence theory. Systems theorist Jeffrey Goldstein places emergence in the context of broader complexity theory and reminds us that "The technical meaning of the term "emergence" as used by complexity theorists is not a new one. It was coined over 100 years ago by the English philosopher G.H. Lewes."(Goldstein, 1999: 53). Lewes himself wrote "The emergent is unlike its components insofar as these are incommensurable, and it cannot be reduced to their sum or their difference" (Lewes, 1879: 412). To take the example of the slime mould, its aggregated manifestation is far

more than the sum of its individual cells and therefore its form and behaviour could not be predicted from knowledge of the initial circumstances, the constituent cells and the basic known laws, for example of physics and chemistry, that apply to them. In developing the concept, Goldstein defines emergence as:

> "the arising of novel and coherent structures, patterns, and properties during the process of self-organization in complex systems. Emergent phenomena are conceptualized as occurring on the macro level, in contrast to the micro-level components and processes out of which they arise."
>
> (Goldstein, 1999: 40)

It is not difficult to see how this idea applies to landscape. Consider, for example, the way in which the basic and known behaviours of water molecules in interaction with particles of silt and sand can continuously produce and re-produce the landscape of a river delta (as in Figure 1) in all its familiar and yet unpredictable patterns. The emergent riverscape is a system that is making itself, in an orderly yet complex fashion, from the micro-level up to the macro. Any landscape could be said to emerge in a similar way, whether the processes which form them are because of hydrology, glaciations, wind erosion, vegetation growth, animal behaviours, or human colonisation. In fact, of course, most of these processes and many more will all act together to form almost all landscapes. Other examples are the micro actions of weathering, bacteria, fungi and insects which combine to produce soils; this activity is usually unseen by people and yet the results underpin all of our land-based ecosystems. More visible examples are the vast u-shaped valleys carved out by the infinitesimal progress of glaciation.

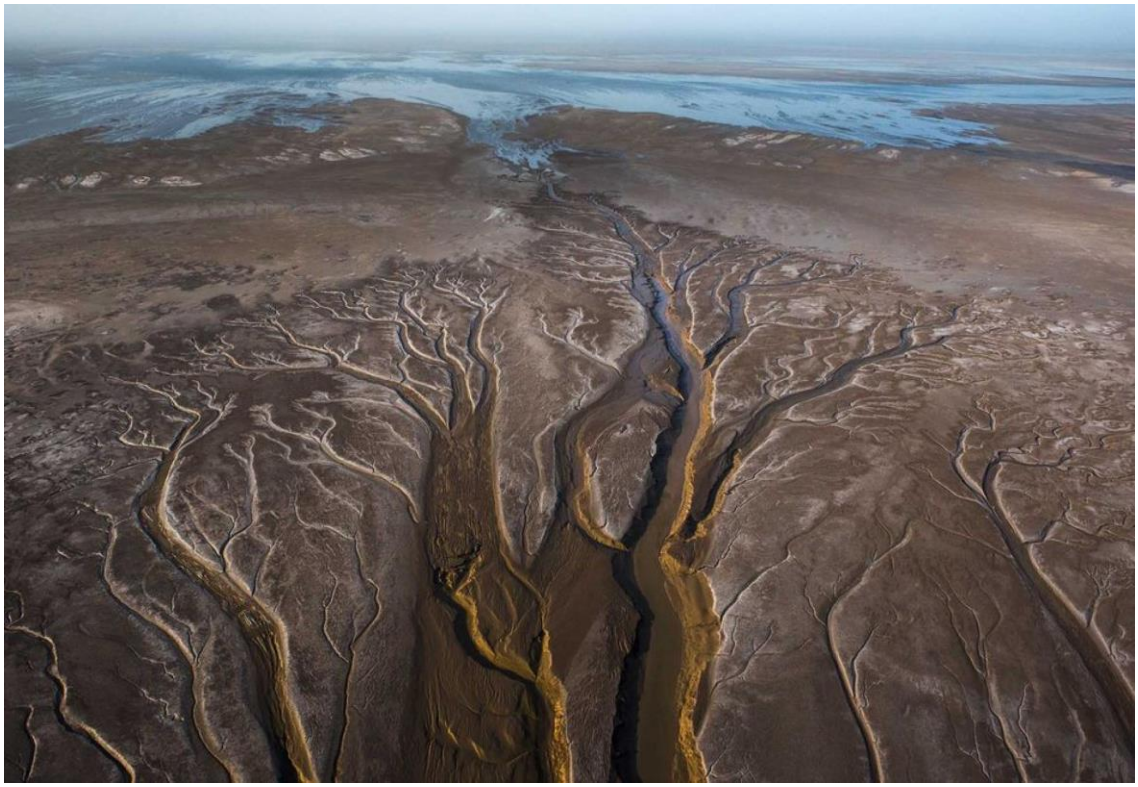

Figure 1. The Colorado River delta, showing the visible and dynamic patterns of deposition of sediment that make this landscape distinctive (photograph, McBride, 2014)

For Goldstein, then, emergent phenomena are 'coherent'. He holds this view in common with British landscape architect and author Simon Bell. In his influential book *Landscape, Pattern, Perception and Process*, Bell states that he is influenced by chaos theory and emergence but says that "the changing world is neither chaotic nor unpredictable" (Bell, 1999: 5). He wishes to see "the fundamental natural order in the world" (Bell, 1999: 8) and claims that "irregular effects on process and pattern can be mistaken for randomness, but belie a deep order"(Bell, 1999: 35). His views could perhaps be described as best fitting the 'weak emergence' model, as he prefers to perceive the landscape as essentially predictable, despite many common examples which contradict this view; forest fires, mud slides, avalanches and flood events. Peggy Holman, researcher in applications of emergence including business management and journalism, lists traffic flows, ant hills and the form of a human baby as examples of weak emergence, as they represent "new properties arising in a system" which are "basically predictable in form" (Holman et al., 2010). It is debatable, however, whether these forms are really so very predictable; after all, each baby is a unique individual.

Landscape architecture has arguably begun to draw on emergence theory through its strong links with the field of ecology, which "began in earnest in the last three decades to include a complex systems perspective" (Lister, 2015: 118). Ecologist William Holland Drury Jr. wrote in 1998 of the problems associated with "clinging to romantic notions of nature's grand design" (Drury, 1998: 1-2) and the misguided rhetoric of "nature's balance" (Drury, 1998: 5). In contrast to Bell, he emphasises that the "first principle is that chance and change are the rule" (Drury, 1998: 6). Drury traces back some of the influences over our tendency to look for 'balance' and equilibrium in ecosystems to Linnaeus' famous essay of 1749, *The Economy of Nature*. Linnaeus' system of classifying living things and allocating to them a standard globally applicable scientific name using 'genus' and 'species' is common to many specialisms today, and pertinent in this case as landscape architects will have gained their understanding of plant species from ecologists and horticulturalists who depend on the Linnaean taxonomy of Kingdom, Phylum, Class, Order, Family, Genus and Species. For Drury, "Linnaeus's system carries a profound subliminal message: that each species was created as it is." (Drury, 1998: 16). Drury's lifetime of experience and observation, however, suggest that living entities cannot be so easily fixed:

> "I remember my botany professor searching over a hillside covered with individual plants of a particular species until he found a "perfect" representative of the variety he had in mind. His comment when he finally found the right specimen was that this individual was 'typical'."
>
> (Drury, 1998: 17)

This anecdote reminds us that we cannot truly state the precise characteristics of any sexually reproducing species, and illustrates exactly the problem/opportunity of emergence. Constantly evolving and diverging, interacting with other individuals and with their environment, species do not pause for us to describe them, so the notion of 'species' can only be an approximate guide for humans to categorise their perceptions of living things, never an accurate ontological description. This observation directly addresses a key proposition of emergence theory, summarised here by Rod Barnett:

> "the real processes, objects and relations that comprise the world and which landscape architecture undertakes to design, organize and manage, are continually unfolding, producing further relations and making new connections."
>
> (Barnett, 2013: 4-5)

Thus, as a species of wildflower evolves so do its pollinators, these changes in turn influence the wider ecological systems of insect predation, soil and vegetation patterns. All of these systems are open to each other and ultimately to every other system in the landscape, be it climate, hydrology or human society.

The publication in 2013 of Rod Barnett's *Emergence in Landscape Architecture* marks a significant move by the academic establishment towards this qualitatively different understanding of landscape, which has real and potentially revolutionary implications for practice. He repeatedly reminds readers that landscape is comprised of a number of interacting open systems:

> "Open systems are complex…their components are connected by networks of feedback loops operating at different levels, different scales and different rhythms. Landscapes work like this."
>
> (Barnett, 2013: 49-50)

For Barnett, the openness of systems means that any human, and therefore the designer, is inseparably a part of the landscape. Another consequence of open systems is that it is never possible, for example, to meaningfully separate the landscape systems of one country, state or parish from those of its neighbours. The 'parish' has been used in this research only as a conveniently sized landscape represented by one elected body, the Parish Council. Likewise, it would be unrealistic to arbitrarily divide the landscape of one HS2 Community Forum Area from the next (see Chapter Four). Barnett explains the necessary outcome of open systems on our thinking; "A landscape has no outside, for its connectivity to other multiplicities is always complete." (Barnett, 2013: 52). This is an important acknowledgement that site boundaries, such as those delineated by the HS2 Phase 1 Environmental Statement, absolutely cannot be considered to be the true 'edge' of a site; "A landscape is only and always an ecotone, an edge, a continuous immanent spatiality." (Barnett, 2013: 52). Arguably, this leads us to recognise that the 'landscape impacts' of any development cannot be neatly bounded by a line on a map (a map in any case being a subjective representation) and therefore that a top-down isolation of precise locations and people directly affected by proposals is theoretically not possible. This is a significant point, as one's right to petition a parliamentary select committee with objections to proposals is based on the committees' judgement as to whether or not you are a 'directly affected' person and therefore have *locus standi* (the right to appear). Eight Members of Parliament wishing to petition the HS2 committees on behalf of their constituents, for example,

were, in July 2016, judged not to have *locus standi* and therefore could not petition the select committees (The Coleshill Post, July 2016).

The concept of emergence could also be pertinent to a philosophical problem identified by Henri Lefebvre in his influential work *The Production of Space*, first published in 1974. This work posits space as both a product and a means of production, and questions the notion of space as something that is always visible and readable. It focuses on urban space but the points made are applicable to any landscape; rural places, too, have populations, economies, and, undeniably, their own complex political terrain. He argues for "the necessity of reversing the dominant trend towards fragmentation, separation and disintegration" (Lefebvre, 1991: 9) of different types of space, and the creation of "an indefinite multitude of spaces…geographical, economic, demographic, sociological, ecological, political, commercial, national, continental, global." (Lefebvre, 1991: 8). Taking the emergent view means that all of these apparently conceptually separate spaces can be conceived of as interrelated open systems within one overarching 'space' which might simply be called landscape. Lefebvre's description of Venice and the connection of the city to its landscape evokes the idea of open systems:

> "The space of settlement on the lagoon, encompassing swamps, shallows and outlets to the open sea, cannot be separated from a vaster space, that of a system of commercial exchange"
>
> (Lefebvre, 1991: 76)

Here, he positions Venice as a specific physical space which is in relationship with a cultural space; the global system of trade. In an open system, it is useless to conceptually separate Venice from the rest of the physical world to which it is linked by waterways. It is equally without merit to divide the material inhabited space of that city, from the idea of Venice as central node in a human system – the commercial network. This network, although physically manifest in shipping routes for trade around the world, is not in itself material, and yet is in relationship with the material Venice. Any landscape works in such a way: a new railway line has impacts beyond its physical presence, as it traverses the countryside between our major cities it will seed social, psychological and economic changes, and as the anticipation of its presence gradually becomes embedded in the national psyche so it will have material impacts on landscape.

Lefebvre initially says of Venice that "the moment of creation is past; indeed, the city's disappearance is already imminent" (Lefebvre, 1991:74). Emergence theory would not describe the creation of a city as originating in a single point in time and nor would it necessarily

distinguish between the period of creation and the period of disappearance. The concept of emergence places change at the heart of what landscape is and clearly describes it as continuously evolving:

> "Emergence is becoming. It is process, change, evolution. Emergence theory attempts to describe how things and the interactive systems that comprise all things can change and develop."
>
> (Barnett, 2013: 11)

For Barnett, the relevance of emergence theory to designers of landscapes is clear; in a statement echoing Matless' view, he says it helps us "to avoid thinking of [landscapes] in terms of images of places and adds another dimension to our understanding of how they work, and how they work on us." (Barnett, 2013: 3). It may be that preoccupation with the visual impedes a participatory design process by reducing a complex place to a brief series of photomontage images that are simply snapshots from an imagined future (see section 4.2). Such public engagement is one-way, top-down, and misses out the crucial element of how the landscape works on 'us', the design professionals.

In accordance with Barnett, this thesis argues that landscape is an emergent, non-linear and open system, and will propose that any public engagement strategy that fails to take the nature of the landscape in to account will be ultimately unsuccessful in terms of attending to the best possible future for the landscape itself, and as a result for its occupants. Overlooking the emergent properties of the landscape is likely to lead to outcomes which are demonstrably negative and which fail to realise potential opportunities for landscape mitigation in places which will inevitably suffer great losses from the very significant land-take of infrastructure projects. Furthermore, it will argue that the engagement strategy itself must be one of emergent citizen participation in landscape design. In order to illustrate this position, emergence theory is here applied to a brief description of the parish of Ashley. The parish is examined in more detail in Chapter Three.